

Sep 79

COMPUTER SPEECH RECOGNITION

a short course for scientists, engineers, and managers



American Institute for Professional Education

Detroit

Boston

Saddle Brook

San Francisco

COMPUTER SPEECH RECOGNITION

a short course for scientists, engineers, and managers

Detroit, Michigan
November 1-2

Boston, Massachusetts
November 8-9

Saddle Brook, New Jersey
November 12-13

San Francisco, California
November 15-16

SEMINAR DESCRIPTION

No longer can computer input facilities be restricted to keyboards or less natural devices like keypunches, push buttons, or switches. The hands-free natural mode of SPEAKING commands has become a currently-limited but extremely promising alternative. Professionals involved with the planning of computer facilities contend that this developing field will substantially alter future computer peripheral devices and human-to-machine interactions. Several manufacturers offer voice input terminals that accurately handle spoken words and formatted word sequences. Research projects have demonstrated the feasibility of machine understanding of total sentences related to specific interactive tasks. Experience in factories, parcel-sorting facilities, automated training centers, and voice-controlled access control have proven that voice entry of data can provide hands-free operation and operator mobility, cut personnel and operating costs, and dramatically ease the workload on busy workers. Industrial entries into this market have tripled in the last two years. There is widespread need for users, evaluators, designers, and researchers to understand the complex interdisciplinary processes involved in computer recognition of speech, so that this promising technology can be properly exploited and advanced.

The American Institute is proud to offer this intensive two-day course by one of the top leaders in this field. Computer Speech Recognition will:

- (1) Introduce the student to all the practical ramifications of talking to computers.
- (2) Provide overviews and intensive studies of the inner workings of recognizers, which will enable the student to contribute to this fascinating field or gain from future use of available technology.

During the course, the student will receive comprehensive instruction about basic theory, experimentation, system design, performance evaluation, and practical problems with recognizers, and will do exercises that clarify speech and language processing concepts.

WHO SHOULD ATTEND?

Research engineers, computer scientists, design engineers, engineering managers, linguists, computer market analysts, data processing professionals, and educators, who desire a broad but in-depth knowledge of the advanced new technology. No direct experience or training in speech science, linguistics, signal processing, pattern recognition, or artificial intelligence is required. All those interested in using this new technology or starting projects in this interdisciplinary field will find Computer Speech Recognition invaluable.

For more information about registration, call (201) 377-7400.

COURSE MATERIALS

Course materials include a comprehensive Seminar Workbook summarizing all topics in the course outline, plus a copy of the reference textbook, TRENDS IN SPEECH RECOGNITION, published by Prentice-Hall, Inc. A step-by-step program is provided for study of the complete textbook and other references upon completion of the short course.

COURSE DIRECTOR

Dr. Wayne A. Lea has published extensively about various speech recognition topics, for over 13 years, and is the editor of the textbook TRENDS IN SPEECH RECOGNITION. He currently is a Research Linguist and Research Engineer at Speech Communications Research Laboratory, where he directs projects in the comparative evaluation of speech recognizers, prosodic analysis of speech, assessment of recognizers for airborne applications, and refinement of the LOCUST sentence understanding system. Dr. Lea has previously conducted research on speech recognition and computational linguistics at MIT, NASA, PURDUE UNIVERSITY, and SPERRY UNIVAC. He recently completed a comprehensive review of the ARPA speech understanding project, surveyed the field, and recommended to several DOD agencies that work should be funded in future years. Dr. Lea is Adjunct Associate Professor in Linguistics at the University of Southern California, where he has taught speech recognition to engineers, computer scientists, and linguists. He has consulted with several companies about how to enter the field of speech recognition.

COURSE OBJECTIVES

- Learn the many advantages and practical applications of computer speech recognition.
- Explore a broad range of topics — including acoustic signal processing, computer detection of vowels and consonants and analysis of linguistic structures of spoken commands and human-to-machine discourses.

- Evaluate the capabilities of current speech recognizers.
- Learn how to design recognizers to handle talker differences, environmental noise, and telephone and other channel characteristics.
- Explore the promising current speech recognition techniques.

COURSE OUTLINE

FIRST DAY

1. INTRODUCTION

Distinguishing Message Recognition from Other Speech Processing Topics
Outline of Various Interdisciplinary Viewpoints of Recognition

2. WHY SPEAK TO COMPUTERS?

Advantages and Disadvantages of Voice Communication
Experimental Evidence Favoring Speech Input to Computers
Successful Practical Applications of Commercial Speech Recognizers
How Much Can You Say to a Machine?

3. WHAT MAKES SPEECH RECOGNITION DIFFICULT?

Dimensions of Difficulty in Recognition
Speaker Differences
Acceptable Variabilities in Pronunciation
Coarticulation and Slurred Speech
Noise, Distortions, and Environmental Effects

4. AN HISTORICAL REVIEW OF RECOGNITION TECHNIQUES:

I. EARLY HISTORY

Sound Spectrographic Analysis
Early Recognizers of Isolated Digits
Template Matching versus Linguistic Feature Detection
Recognition of Phonetic Sequences
Detection of Distinctive Features
Large-Vocabulary Isolated Word Recognizers
Initial Attempts at Continuous Speech Recognition

5. HISTORICAL REVIEW: II. CONTRIBUTIONS OF THE ARPA SPEECH UNDERSTANDING RESEARCH PROJECT

The Dogma of Speech "Understanding" Systems
Goals and Results of the ARPA SUR Project
Advanced Contributions to Aspects of System Design
Research on Acoustic and Linguistic Characteristics of Spoken Sentences

6. HISTORICAL REVIEW: III. RECENT RESEARCH AND DEVELOPMENT PROJECTS

Advanced Techniques for Recognizing Isolated Words
Approaches to Recognition of Continuous Speech
Current Projects at Bell Laboratories, IBM, Sperry Univac, ITT, Texas Instruments, MIT, Carnegie-Mellon University, SCRL, and other research groups
Current Work in Other Countries
A Review of U.S. Governmental Funding and Governmental Needs

7. CURRENT COMMERCIAL DEVICES AND PRACTICAL APPLICATIONS

A Broad 'Spectrum' of Costs and System Capabilities
Hobbyist Voice Input Devices
Accurate Voice Terminals
Total Integration within Automated Data Entry Systems
Successful Usage within Factories and Offices
Military Applications
A Case Study: Critical Issues in Airborne Applications

8. MODELS AND THEORETICAL CONCEPTS IN SPEECH RECOGNITION

The Ultimate Goal of Recognition
Equivalences of Signals and Messages

Knowledge Sources Pertinent to Speech Understanding
Evaluating System Performance
Symbol Concatenation Systems and Linear Strings
Signal Equivalences

SECOND DAY:

9. INTRODUCTION TO SPEECH COMMUNICATION PROCESSES

Physiology of Speech Production
Articulation of Various Vowels and Consonants
Speech Acoustics
Perceptually Important Acoustic Features
Prosodic Structures of English
Coarticulation and English Phonology
Role of Grammatical Structures, Semantics, and Task
Discourse in Message Recognition

10. ACOUSTIC SIGNAL PROCESSING TECHNIQUES AND SPEECH FEATURE EXTRACTION

Spectral Analysis, Analog and Digital Filters
Linear Predictive Coding and Smoothed Frequency Spectra
Formant Tracking Algorithms
Pitch Tracking, Energy Contours, and Prosodic Analysis
Detecting Vowels and Consonants
Segmenting and Labeling of Speech
Phonetic Lattices

11. IDENTIFYING WORDS FROM PRONUNCIATIONS

Template Matching on Total Word Patterns
Dynamic Programming Techniques
Matching Errorful Phonetic Sequences
Phonological Analysis and Lexical Decoding Networks
Word Juncture Phenomena

12. SYNTACTIC, SEMANTIC AND PRAGMATIC ANALYSES

Grammars that Constrain Allowable Word Sequences
Finite State Grammars and Pronunciation Networks
Semantic Constraints on Recognition Processes
Pragmatic Information about the Task and Discourse
Linguistic Controls on Task Complexity

13. ALTERNATIVE SYSTEM STRUCTURES

Bottom-up (Data-Driven) Analysis
Top-Down (Task-Driven) Analysis
Analysis by Synthesis
Hypothesize-and-Test Procedures
The Hearsay Blackboard Structure
The Harpy Integrated Network

14. HOW SEVERAL AVAILABLE RECOGNIZERS WORK

Threshold Technology Systems
Interstate Electronics' Voice Data Entry Systems
Nippon Electric Word-Sequence Recognizer
Valuable Concepts in the Sperry Univac Systems
CMU Harpy System for Research on Continuous Speech Recognition
CMU Hearsay System for Speech Understanding Research
Needed Refinements in Available Systems

15. SUMMARY AND MARKET PROJECTIONS

The Past, Present, and Future of Speech Recognition
Gaps in Current Technology
Projects for Future Work
The Large Future Market
Choosing Your Role in the Future of this Field

COMPUTER SPEECH RECOGNITION

American Institute for Professional Education

Carnegie Building, Hillcrest Road, Madison, NJ 07940 • (201) 377-7400

DETROIT, Nov. 1-2, 1979

Detroit Plaza Hotel
Renaissance Center
Detroit, MI 48243
(313) 568-8000

BOSTON, Nov. 8-9, 1979

Boston Park Plaza
64 Arlington St.
Boston, MA 02117
(617) 426-2000

SADDLE BROOK, Nov. 12-13, 1979

Marriott Hotel
I-80 at Garden State Parkway
Saddle Brook, NJ 07662
(201) 843-9500

SAN FRANCISCO, Nov. 15-16, 1979

Ramada Inn-Fisherman's Wharf
590 Bay at Jones
San Francisco, CA 94133
(415) 885-4700

REGISTRATION INFORMATION

COURSE FEES: The \$450 registration fee includes the seminar, the course notebook and a copy of the reference textbook, *TRENDS IN SPEECH RECOGNITION*, published by Prentice-Hall, Inc.

DISCOUNT SCHEDULE: Three or more registrations made concurrently from the same firm are entitled to a 10% discount.

REGISTRATION: Attendance level is limited and sessions tend to fill up well in advance of workshop dates. To register, mail the registration form or phone Kristy Monahan at (201) 377-7400.

CANCELLATIONS: The registration fee is fully refundable up to three business days prior to the starting date of the seminar. A charge of 50% to cover incurred expenses will be assessed for any cancellation after that date. Transfers and substitutions may be made at any time at no charge.

HOTEL ACCOMMODATIONS: Contact the hotel directly to reserve a room. A block of rooms will be held at the hotels listed above until two weeks prior to the seminar. Please identify yourself with The American Institute when making your reservation.

COURSE SCHEDULE: Classes are held from 9:00 A.M. to 5:00 P.M. each day. No evening sessions are scheduled.

GUARANTEE: All participants will benefit from this unique seminar/workshop. The American Institute for Professional Education believes that **Computer Speech Recognition** offers the

best possible training available in this field. If, during the course, any participant is dissatisfied, for any reason, the full seminar fee will be refunded.

1.5 CEU'S AWARDED: The participants who successfully complete the course requirements are awarded 1.5 Continuing Education Units.

As the national standard for the recognition of non-university professional education, the CEU has been adopted by the extension divisions of over 600 colleges, by numerous professional associations, and by other specialized educational groups. A permanent record of CEU awards is maintained by The Institute.

ON-SITE TRAINING SESSIONS: For further information about sponsoring this workshop for groups of 15 to 30 professionals within your organization, please contact Anne Post, Education Director.

ABOUT THE INSTITUTE: The American Institute for Professional Education, founded in 1972, is a non-profit organization serving the educational needs of professionals. Seminars were originally conducted in areas directly related to the banking and finance industries. Through the years, The American Institute has broadened its scope to provide for the interdisciplinary needs of professionals in today's rapidly expanding technological fields. Seminars/workshops are held throughout the United States, Canada and Europe. For a current listing of sessions available call Kristy Monahan, Registrar, (201) 377-7400.

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COMPUTER SPEECH RECOGNITION

TYPE OF REGISTRATION

- ☐ **Single \$450**
☐ **Multiple**
(See discount schedule)

METHOD OF PAYMENT

- ☐ **Check enclosed**
☐ **Bill My Firm**
☐ **Please send more information about on-site training.**

CHOICE OF SESSION

- ☐ **Detroit, Nov. 1-2**
☐ **Boston, Nov. 8-9**
☐ **Saddle Brook, Nov. 12-13**
☐ **San Francisco, Nov. 15-16**

NAME & TITLE _____

NAME & TITLE _____

NAME & TITLE _____

ORGANIZATION _____

ADDRESS _____

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Registration Phone: (201) 377-7400